STRENGTHENING THE LINK BETWEEN FORMAL TRAINING AND INFORMAL ENVIRONMENT: PRE-SERVICE BIOLOGY TEACHERS’ KNOWLEDGE ON PLANNING FIELD TRIPS

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ABSTRACT

Much research has been done on science learning in formal classroom settings in contrast to science learning in informal context. Informal science learning such as field trips provides genuine education that is in-line with social-constructivist theory of learning because it provides students with concrete phenomenon to construct knowledge. The informal science learning settings are very diverse and teachers do generally face obstacles when they try to link their formal training with these informal environment. The aim of this study was to provide pre-service teachers with the experience of planning a field trip that could help them strengthen the link between formal classroom settings and informal learning environments. This study was conducted during a biology teaching method course. Sixteen pre-service Biology teachers were asked to work in groups of four to plan for a field trip. Their task was to teach a biology concept via field trip. They were asked to plan their task based on three-parts: pre-visit, site-visit and post-visit. The data sources were a booklet and a 500-word individual reflection of their perceptions of the field trip assignment. The results revealed that these pre-service teachers were more concerned with the logistic aspects of their field trips as compared to the learning processes of their students. The pre-service teachers however, held positive views about the inclusion of informal settings when teaching biology concepts. This study has implications for teacher education programmes about the necessity of strengthening the link between formal training and informal learning environment.

Keywords: Field trips, informal learning, pre-service teachers, biology

Introduction

Commonly research in science learning is done in formal education settings; however there is also a growing body of literature that examines science learning in an informal context (Griffin, 2012; Holliday, Lederman & Lederman, 2014; Hung, Lee & Lim, 2012; Kisiel, 2007). Informal education can be viewed as any educational enterprise where teachers guide or supervise in a setting outside the classroom (Griffin, 2007; Rebar & Enochs, 2010). Field trips, an example of informal educational setting, present science in a real world context and provide learning opportunities that are more authentic and relevant to students, in line with social-constructivist theory of learning (Braund & Reiss, 2006). Field trips furnish students with concrete experiences where they are able to manipulate concrete phenomena and materials (Kisiel, 2013). This provides the students with pathways to construct and amplify abstract concepts as well as allows for transitional learning where students are able to move from primary/simple concepts to secondary/complex concepts (Orion, 1993; Orion & Hofstein, 1994). Thus, it is not surprising that using field trips as an instructional method has positive gains for students in terms of social, affective and cognitive domains (Anderson, Kisiel & Storksdieck, 2006; Griffin & Symington, 1997; Orien & Hofstein, 1991).

Through field trips, teachers are bestowed with an approach to teach science where teachers could use these opportunities to allow students to carry out scientific observations, short and authentic investigations, and hold group discussions (NRC, 2001; Tal, 1999, 2001). Unfortunately, teachers are not skilled at conducting field trips because teachers have little recognition of the different learning environments that could provide different learning opportunities for their students (Griffin & Symington, 1997). Thus, teachers are unsuccessful at planning and facilitating field trips (Tal, Bamberger & Morag, 2005). When planning for field trips, teachers tend to impose formal classroom techniques to informal settings (Griffin & Symington, 1997). In other words, teachers do not seem to know how to link school science more purposefully and intricately with ‘out-of-school’ science activities. This is because teachers do not have the expertise to monitor diverse students’ experiences and how to build on these students’ experiences outside the classroom (Amo & Reiss, 2006). Teachers also face ‘out-of-the-classroom’ challenges where teachers are inexperienced about choosing the most unique opportunities present in these environment within the limited time available (Rebar, 2012). As a result, field trips organized by teachers generally see students rushing to complete the given tasks because teachers have created too many activities (Kisiel, 2006). These inadequacies in teachers do...
exist because teachers rarely receive formal training on leading effective and meaningful field trips (Anderson, Kisiel & Storksdieck, 2006; Rebar, 2012).

As informal science setting is very diverse, teachers face obstacles to overcome links between formal training and informal environment (Fenichel & Schweingruber, 2010). Consequently, it is imperative to openly introduce pre-service teachers to informal setting in hope that they would gain knowledge and experience to strengthen the links between traditional classroom setting and informal settings (Tal, 2001). Studies have shown that when pre-service teachers are exposed to field trips and are given the opportunity to discuss effective field trip pedagogy, it helped them to be more confident and willing to see field trip as an enriching addition to their classroom (Anderson et al, 2006; Tal, 2001). When summarizing research on informal science, Rennie (2007) concluded that pre-service education can be enhanced by providing pre-service teachers experience beyond lecture halls. He added that even “something as simple as investigating the learning potential of a community-based science resource” (p.155) can enhance these teachers skills and knowledge in informal settings.

Correspondingly, many studies have been conducted on pre-service teachers in informal settings. Jung and Tonso (2006) developed a teaching practicum for their pre-service science teachers at the local nature and science centers. The pre-service teachers together with the center educators conducted sessions to school students. The study reported that pre-service teachers recalled that the ‘positive experiences in non-threatening environments’ (Jung & Tonso, p. 20), not only support their pedagogy development but also their science learning. In another study, Osln, Cox-Peterson and McComas (2001) asked pre-service teachers to reflect on field trip visits as resources for their students. After learning and practicing effective field trip strategies, these pre-service teachers’ concerns shifted from management issues to students’ learning. They also reported that this experience gave them confidence to conduct future field trips.

However, Rebar (2012) stated that pre-service teachers draw from many personal experiences when organizing and leading field trips and personal experiences are deeply rooted. In contrast, pre-service teachers’ beliefs and philosophies that are developed during teacher education are often weak and fragile. He added that, unless pre-service teachers are provided with direct engagement with field trips activities these pre-service teachers would tend to revert to established beliefs about teaching, often shaped by their prior experiences as students. Direct engagement with field trips activities not only render meaningful experiences but also could be part of a conceptual change (Posner, et al., 1982) in teachers using these field trips as additional resources for their student learning (Kisiel, 2013).

This study aims to strengthen that link between formal classroom setting and informal learning by exposing pre-service teachers to the concept of learning beyond classroom. Due to the course description, there was not much time for extensive field trip pedagogy. Acknowledging that informal setting with its variety of resources could be a potential teaching method, the researcher realized that pre-service teachers should not only be given the professional knowledge and skills but to immerse them into actually carrying out a field trip. This course provided an opportunity for the researcher, who was also the instructor for this course to develop an assignment where pre-service teachers were asked to plan for a successful field trip. This study encouraged pre-service teachers to recognize informal sites as places that could help them enhance their teaching by providing resources, hands-on experiences and materials. This study also provided venue for these pre-service teachers to understand that informal educational setting provides unique learning environment for students as it provides open-ended, interest-driven and personalized learning (Kisiel, 2013). Two questions that guided the inquiry here were:

1. What are pre-service biology teachers’ knowledge and skills on planning a field trip?
2. How are the pre-service biology teachers’ perceptions after planning a field trip?

Methodology

The participants in this study were sixteen pre-service teachers enrolled in the Biology Teaching Methods course for one semester. The aim of is course was to introduce the undergraduate students to the various teaching approaches in Biology as well as to provide them with opportunities to develop their own principled understandings and practice of the concept of appropriate biology teaching at secondary level. The course was designed as a bridging between what they had so far learned at the earlier stages of their teacher education programme and how to integrate this knowledge into approaches and teaching methods in the classrooms.

The study was primarily based on qualitative data collection techniques. The study
commenced with classroom discussions. Firstly, a two-hour in-depth discussion was held where students talked and discussed their experiences on field trips as a student. They elaborated on experiences that they enjoyed and what they disliked. Secondly, another two-hour discussion was held where these pre-service teachers were asked to envision how they, as teachers, would conduct a field trip. The researcher was a participating observer. The researcher of this study took down field notes as the discussions were on-going and later reflection of these discussions. The discussion among the pre-service teachers resulted in a general framework which consist questions that teachers would ask themselves when planning and implementing a field trip.

After the two classroom discussions, the pre-service teachers were divided into four groups (consisting of four persons). They were provided with an assignment to conduct a field trip with their group members. The set-up of the assignment was open-ended where participants were given the choice to pick any scientific community-based environment and to link the concepts that they intend their students to observed at the informal site with syllabus of either Form 4 or / and Form 5 national Biology curriculum. They were encouraged to collaborate with the person in-site and ask for advice on resources. They would then do site visitations to collect data on the availableness of resources and to create/compile tasks that they feel would enhance their students’ learning progression. The researcher wanted the participants to have flexibility and creativity while staying true to the underpinning course of increasing students’ engagement with challenging content and interest. Ad hoc discussions were held when pre-service teachers faced challenges and issues in moving forward with their assignment. The pre-service teachers were asked to document all their planning and implementation of the field trip into a booklet which was to be submitted as group work. They were also asked to submit, individually, a 500-word reflection of their experiences/perception of the entire process. The participants were asked to present their findings (as a group) via a 20-minute power-point presentation. The presentation was done for other group members to ask questions about the field trip sites and to learn from each other’s experiences.

The data from the three sources, the field notes, the booklet and the students’ reflections, were used to describe and promulgate the participants’ knowledge in conducting a field trip. This study intents to unveil the ‘richness and depth of meanings and perceptions in the events being studied’ (p. 124; Griffin, 2012) through a descriptive analysis. The content in the booklet was analysed by using the Fieldtrip Framework (will be discussed in the next section). This information in the booklet revealed how much knowledge and skills the participants had in conducting a field trip. Opinions that students stated in their reflection were used to analyse the pre-service teachers’ perceptions on conducting a field trip.

Research Finding

Prior to planning for the field trip, the pre-service teachers’ were engaged in a two two-hour classroom discussion. In the first discussion, the pre-service teachers talked about their experiences when they went on a field trip as students. Subsequently, in the next discussion, the pre-service teachers viewed themselves as teachers and how they would conduct a field trip for their students. All participants agreed that they had experienced going on a field trip as a student, especially during their primary schooldays. Nevertheless, none of the participants had experienced conducting a field trip. One participant admitted that she had witnessed how her mother, who is an in-service teacher, conducting field trips. Through these discussions, the participants talked freely about how they enjoyed learning outside their classrooms. However, they admitted that they rarely were able to connect what they experienced in the informal environment to what they were learning in their formal classrooms. As teachers, the participants affirmed that they would not be able to conduct field trips individually. This was because these trips would normally take the whole day and they would need to use the other teachers’ ‘teaching periods’. They also need help to manage a large number of students in these informal environments, hence the support of other teachers. They also discussed that conducing a field trip is not a simple task and agreed that there were at least three stages of implementation: pre-visit, site-visit and post-visit. They were encouraged to discuss what elements would they have to pay attention to during each of the stages of implementation. The discussion among the pre-service teachers resulted in a general framework which consists of questions that teachers would ask themselves when planning and implementing a field trip. The Fieldtrip Framework has three sections: Pre-visit, Site-visit and Post-visit as shown in Table 1. The participants used the Fieldtrip Framework to guide them in their planning and implementation of their field trip.
Table 1: The Fieldtrip Framework

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<thead>
<tr>
<th>Section</th>
<th>Guiding Questions</th>
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<tbody>
<tr>
<td>PRE-VISIT</td>
<td>What are the main factors that you will consider in selecting your place of visit?</td>
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<tr>
<td></td>
<td>How do you feel that this visit is going to benefit your students?</td>
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<tr>
<td></td>
<td>What is the teacher’s role in this visit?</td>
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<td></td>
<td>What are your main concerns regarding this visit?</td>
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<td></td>
<td>What are the elements that you need to consider (logistics, safety, duration etc.) in the preparation of this visit?</td>
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<td></td>
<td>What are the learning outcomes that you envision for your students?</td>
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<td></td>
<td>What type of students (low/ high ability) are suitable for this visit that you are planning and why?</td>
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<td></td>
<td>What tasks should the students do? What preparations should the students need to do?</td>
</tr>
<tr>
<td>SITE-VISIT</td>
<td>What kind of assistance you would provide your students so that they are able to complete the task that you have given them to do for this visit?</td>
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<td></td>
<td>How do you envision yourself maintaining the interest of your students during the visit?</td>
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<tr>
<td></td>
<td>How do you feel that you can enhance your role as a facilitator to help students to achieve their learning outcomes?</td>
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<tr>
<td>POST-VISIT</td>
<td>Did you think that your visit was successful? Why?</td>
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<tr>
<td></td>
<td>How do you think that you can improve so that your future students could benefit more from such visits?</td>
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<td></td>
<td>Explain how you would conduct a post-visit discussion with your students?</td>
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<td></td>
<td>How do you evaluate these learning outcomes?</td>
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</table>

The findings will be discussed based on the Fieldtrip Framework. In the pre-visit stage, all the four groups of pre-service teachers choose different sites to visit. All groups managed to link the site of their choice with the formal Biology Form 4 or/and 5 curriculum. For example, one group decided to conduct a field trip to Hutan Simpanan Bukit Nanas (Taman Eko Rimba, Kuala Lumpur), Mini Animal Zoo and Mini Aquarium at KL Tower to teach the topics ‘Nutrition’ and ‘Dynamic Ecosystem’. Within the main topics, subtopics were chosen - subtopic 6.13 – A caring Attitude towards Plants and subtopic 8.1 – The Abiotic and Biotic Components of the Environment.

All groups provided very detailed description on the logistic aspects for the field trip. In many of their booklets, there was evidence of person-in-charge and the responsibilities involved in how to get approval from principle, parent permission letter, how to arrange for transportation, what special equipment to take such as video/digital camera and first aid kits, and to prepare name tags for students and teachers. Even during the site-visit stage, one group was still very concerned with logistic aspects. In their booklet, they had written down in one section about the roles of teachers during the visit. They explained that the teachers’ role was to act as a tour guide and a facilitator. They commented that teachers should act as parents when they are at the site and they own need to explain the concepts that they want their students to learn as a “story-teller” (Booklet).

For the site-visit, the groups have managed to prepare relevant tasks. Two of the groups have devised tasks that encourage students to explore the site and answer questions through observations and help from the in-site experts (park rangers). This group prepared a task where students during jungle trekking were asked to observe their surroundings and to record certain aspects that were asked in the tasks. For example, the task asks the students to list - ‘three abiotic and three biotic components of the ecosystem’ (Booklet). This group also did an experiment to ‘investigate the distribution of plants using the quadrant sampling technique’ (Booklet). They explained that this experiment was rarely done because most schools do not have a big area to randomly select sites occupied by various species. Another group played a game where the students were given clues and they had to identify plants pertaining to that clue. In the Booklet, they had
written ‘The clue is “red skin”. Observe the plant and find the reason on why that plant looks like that’ (Booklet). In order to put the ‘fun’ element for the field trip, one group suggested the play a game named ‘CANDID Photo Station Game’. The game was played like this: the teacher would show the students photographs of various locations at the site during the field trip and students were required to take a creative snapshot of their group at that location. The most creative snapshot would win a prize.

For post-visit stage, the pre-service teachers said that they would hold discussions about the trip and also discuss the worksheet/ tasks given to their students during the field trip. Two of the groups also suggested that they would ask their students to write a reflection about their experiences during their field trip. In this reflection, they said that they would ask their students to write about how the field trip enhanced their understanding of the biology concepts that they were learning in the formal classroom. The groups also gave suggestions on how they plan to improve the process of conducting field trips in the future. They felt that it was important to strengthen the ties between formal classroom setting and informal learning.

In the 500-word reflection, all students shared positive comments about the ideas and perceptions of the process of conducting a field trip. They agreed that field trips must begin with good planning because ‘if we just bring students for field trips without good planning, we tend to face a failure trip’ (Reflection). They also acknowledged that field trips must be connected with the formal curriculum. One of the pre-service teachers commented that ‘the chosen destination must help to reinforce in real life terms what the student have studied from the classroom’ (Reflection). Some of the pre-service teachers penned that field trips provided a venue for active learning for the students. This is because ‘students can have hands-on experiences with the rich resources of the local community’ (Reflection). They also commented about the benefits of learning in a real-life environment. One of the pre-service teachers commented ‘The field trip is different compared to learning in the classroom. During these trips, students get to see in real situations, observe and touch... get more opportunities to explore everything they want to learn’ (Reflection). Thus, these pre-service teachers believed that biology school students could increase their knowledge and understanding and to ‘add realism to the topic of study’ (Reflection) when they experience learning in an informal setting. The pre-service teachers also stated the affective domains could be enhanced when teachers and students go on field trips. They suggested that these affective outcomes are reinforcing positive teacher-students relationship and to reduce boredom. They elaborated that the teacher-student relationship could be enhanced because ‘without the restriction imposed in classroom, perhaps through the field trip the bond between students and teacher can become stronger’ (Reflection). Similarly, one pre-service teacher penned her idea that ‘Biology is about life which is governed by natural mechanism...they feel bored when... knowledge is only transferred through telling or memorizing...’ (Reflection).

Lastly, one participant commented that the visit had ‘taught me to appreciate and love the nature... by being flexible and open-minded, being kind-hearted and caring...’ (Reflection).

Discussion

The main problem of planning an educative experience for pre-service teachers is how to bridge the gap between pre-service teachers as learners and as teachers. In this study, there are several instances when the pre-service teachers were asked to collaborate in an investigation as students, while in other instances, they were expected to discuss and share their views as teachers about field trips as learning environments. This study provided the pre-service teachers with a venue to discuss their ideas and thoughts about field trips. These pre-service teachers collaboratively constructed ideas and shared their experiences of field trips and thus enabled them to be more aware of their belief and knowledge about field trips. For example, the pre-service teachers discussed that for the field trips to be effective, it should be planned as an integral part of the curriculum rather than an isolated activity (Hofstein & Rosenfeld, 1996; Orion & Hofstein, 1994). Through explicit engagement and self-reflection on informal learning paved ways for pre-service teachers to think of alternative ways about teaching and also this study provided repository of teaching methods that they will be able to use when they themselves become teachers. Ultimately, the link between formal learning and informal environment could be strengthened.

References

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